

Unit 2 Review Sheet: Forces
AP Physics

1. Newton's Laws:

- Object in motion/at rest stays in motion/at rest unless acted upon by outside force.
- Net force equals mass times the acceleration.
- When one body exerts a force on a second body, the second body exerts an equal and opposite force on the first body.

2. Variables (units): Force (Newtons: N; $\text{kg}\cdot\text{m/s}^2$), mass (kg), acceleration (m/s^2).

3. Free-body diagrams:

- Draw forces perpendicular to each other (break down into components if force is at an angle).
- Draw all forces acting on body, unless told to ignore a certain force.
- Arrows are needed to give direction of forces.
- Lengths of arrows should be approximately equal to magnitude of forces. If the magnitude of the forces is unknown, then simply draw an arrow of some length.

4. Types of forces:

- Applied
- Friction
- Weight
- Tension
- Drag
- Normal
- Spring

5. Weight:

- Acceleration is acceleration due to gravity: 9.8 m/s^2 .
- Always in the downward direction (on Earth).

6. Friction:

- Coefficient of friction is the measure of how difficult it is to drag one object across another object. It has no units.
- Calculated by: Force of friction = (coefficient of friction)(normal force).

7. Normal:

- Always perpendicular to a surface.
- Must have a surface to have a normal force.

8. Spring:

- Restoring force, so the direction of the spring force points in the opposite direction of motion.
- Calculated by: Force of spring = - (spring constant)(displacement from natural length).
- Every spring has a spring constant, and it is experimentally determined. Units: N/m.

9. Important information:

- Direction of net force and acceleration is the same.
- In many problems, the forces in the x- and y-directions may be analyzed independently, and then combined through another force equation or a triangle.
- Friction and drag act in the direction opposite the motion of the object, parallel to the surface on which the object is moving.